

## LA-UR-21-24051

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Title:  $^{239}\text{Pu}(\text{n},\text{f})$  PFNS evaluation: potential release candidate.

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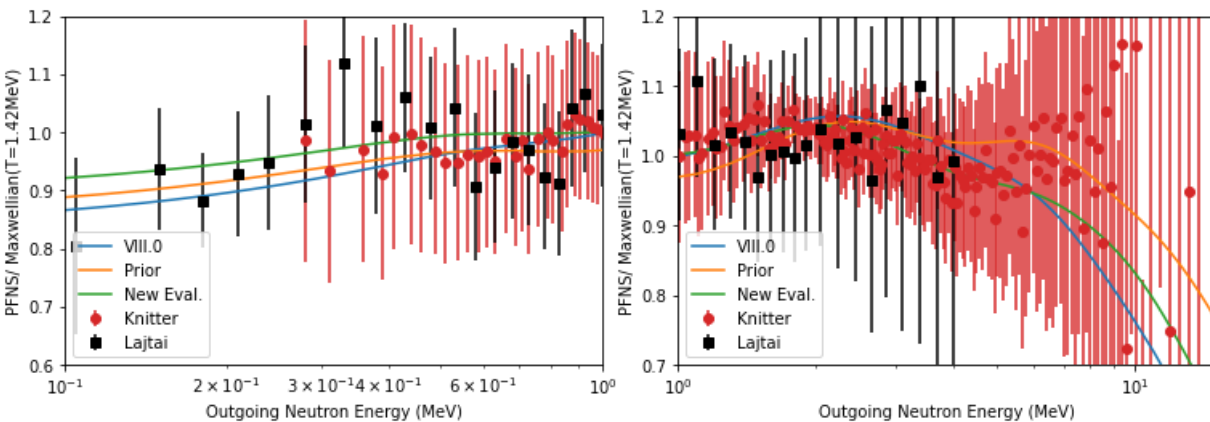
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# $^{239}\text{Pu}(\text{n},\text{f})$ PFNS evaluation: potential release candidate.

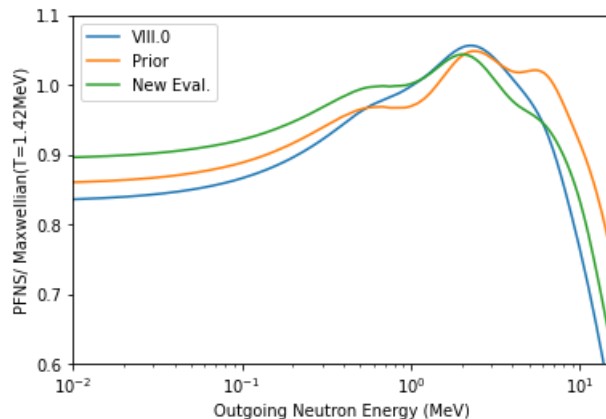
D. Neudecker

March 30 – April 17, 2021

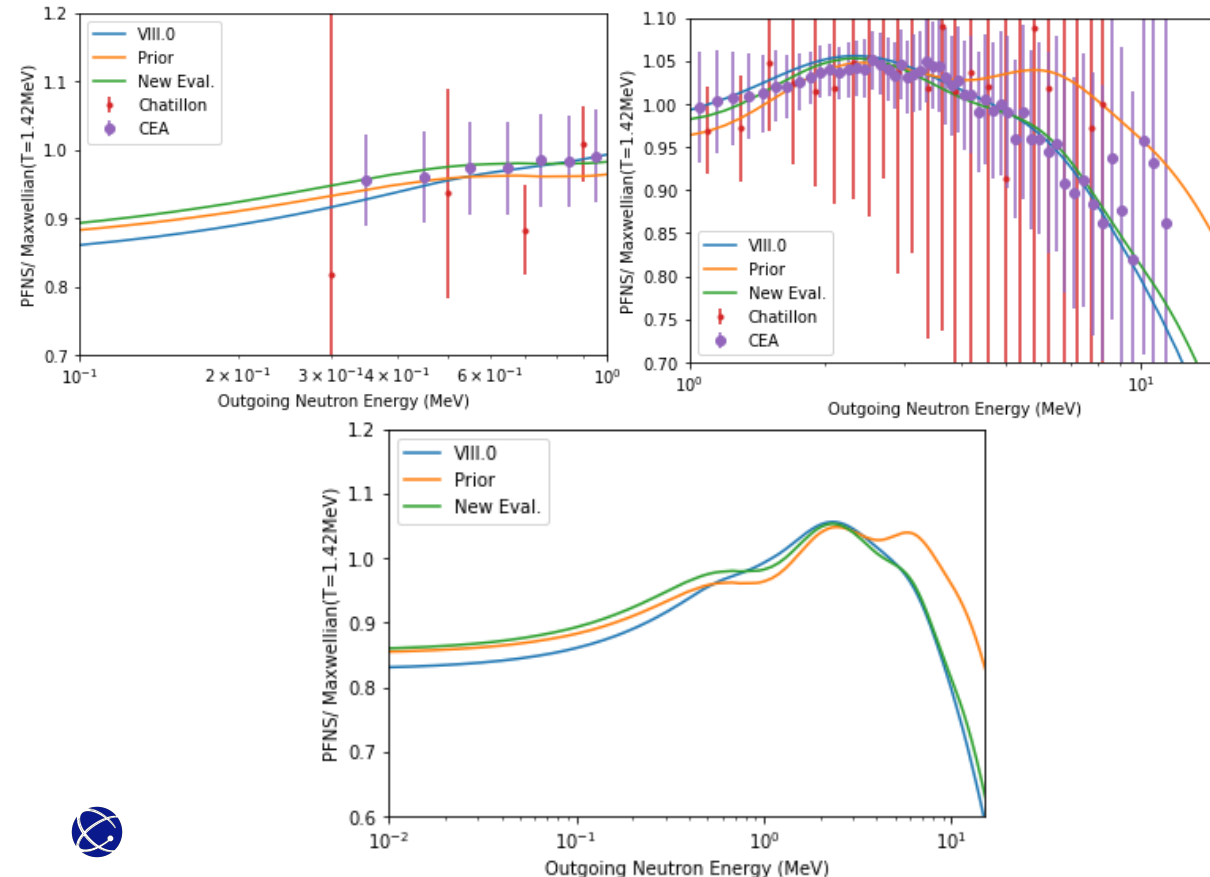
# $^{239}\text{Pu}(n,f)$ PFNS $E_{\text{inc}} = 500$ keV, Mean energy: 2.106 MeV



- Prior: LAM with 6% normalization uncertainty.
- Experimental data:
  - Knitter at  $E_{\text{inc}} = 1.5$  MeV,
  - Lajtai at  $E_{\text{inc}} = \text{thermal}$  (only for extending to lower  $E_{\text{out}}$ , very large unc.).



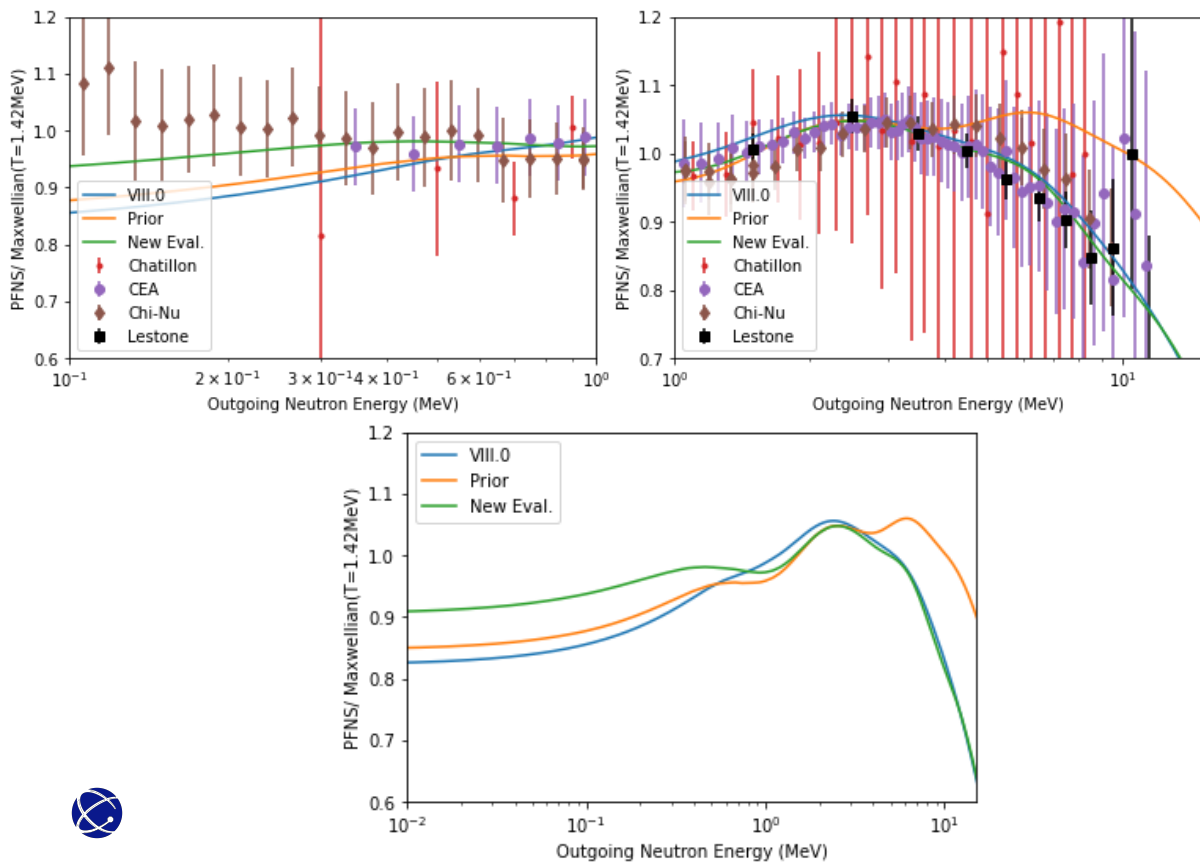
# $^{239}\text{Pu}(n,f)$ PFNS $E_{\text{inc}} = 1$ MeV, Mean energy: 2.131 MeV



- Prior: LAM with 6% normalization uncertainty.
- Experimental data:
  - CEA (mean values corrected, enlarged unc. in wings, approximate cov.),
  - Chatillon at  $E_{\text{inc}} = 1.5$  MeV.



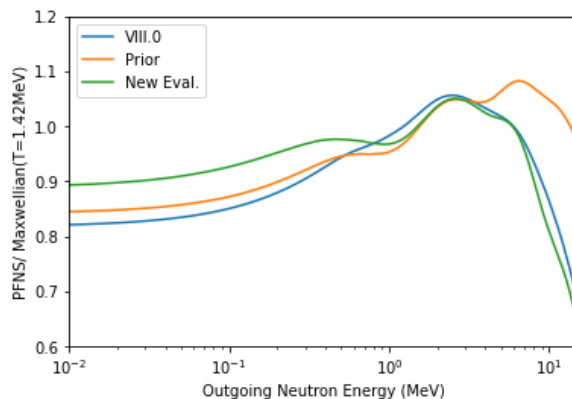
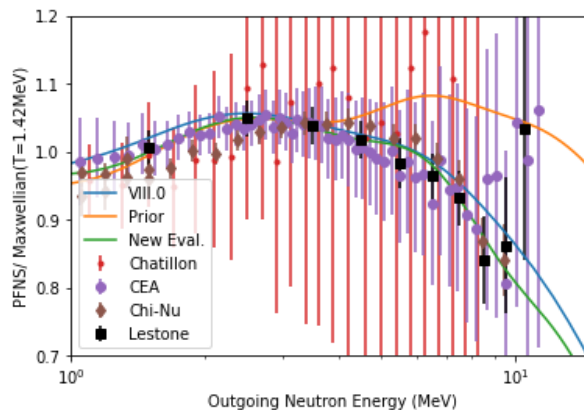
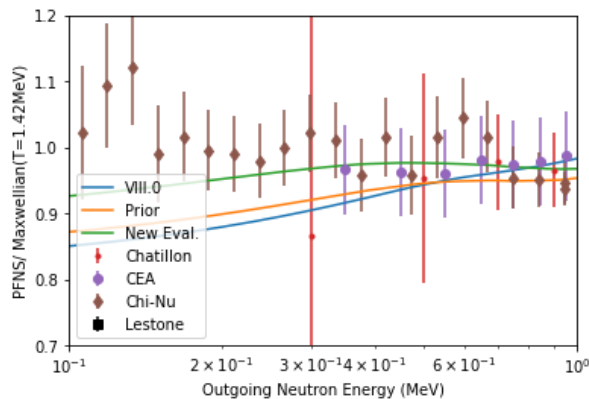
# $^{239}\text{Pu}(n,f)$ PFNS $E_{\text{inc}} = 1.5 \text{ MeV}$ , Mean energy: 2.133 MeV



- Prior: LAM with 6% normalization uncertainty.
- Experimental data:
  - CEA (mean values corrected, enlarged unc. in wings, approximate cov.),
  - Chi-Nu (approximate cov.),
  - Lestone at  $E_{\text{inc}} = 1.5 \text{ MeV}$ ,
  - Chatillon at  $E_{\text{inc}} = 1.5 \text{ MeV}$ .



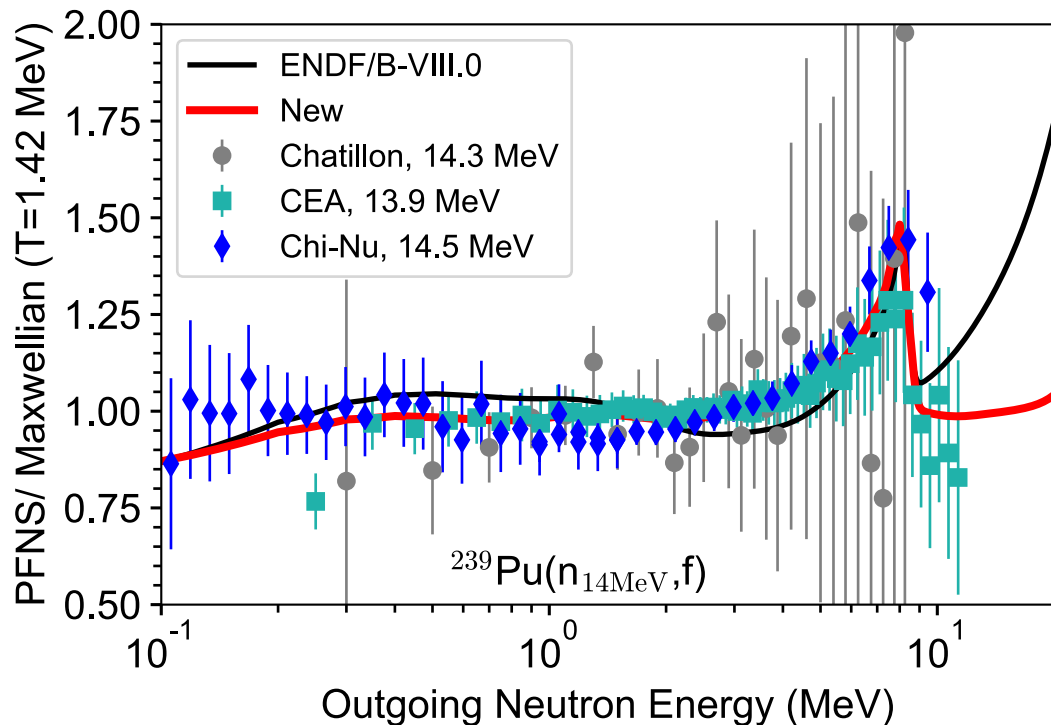
# $^{239}\text{Pu}(n,f)$ PFNS $E_{\text{inc}} = 2 \text{ MeV}$ , Mean energy: 2.142 MeV



- Prior: LAM with 6% normalization uncertainty.
- Experimental data:
  - CEA (mean values corrected, enlarged unc. in wings, approximate cov.),
  - Chi-Nu (approximate cov.),
  - Lestone at  $E_{\text{inc}} = 2 \text{ MeV}$ ,
  - Chatillon at  $E_{\text{inc}} = 2.5 \text{ MeV}$ .



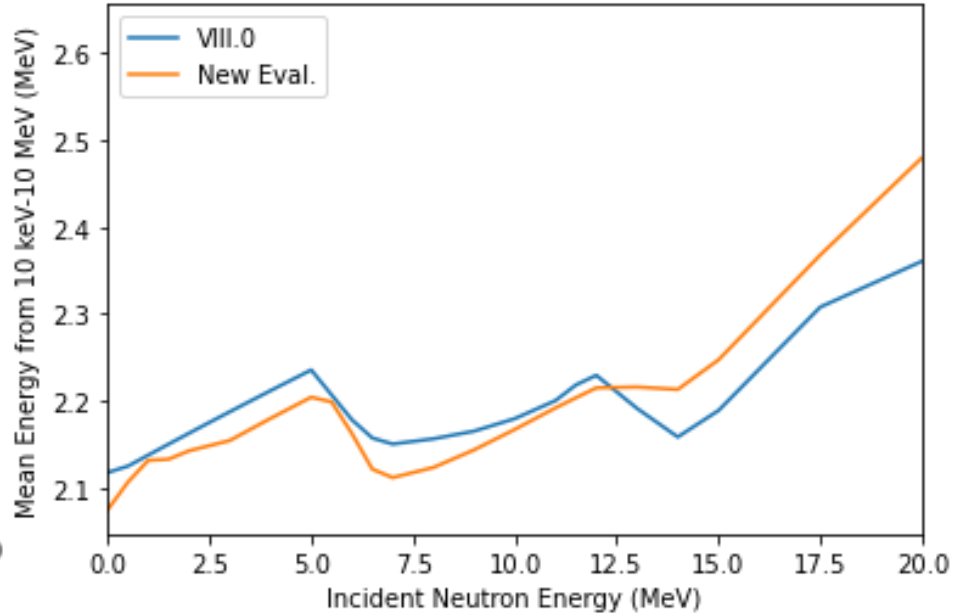
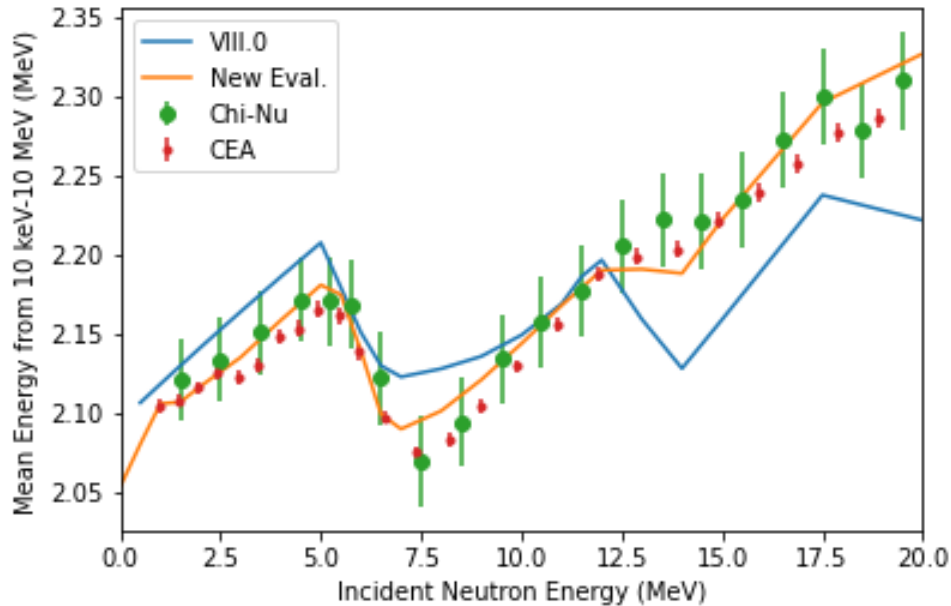
## $^{239}\text{Pu}(n,f)$ PFNS $E_{\text{inc}} = 14 \text{ MeV}$ , Mean energy: 2.213 MeV



- Evaluation from 3-30 MeV.
- Prior: LAM with 6% normalization uncertainty.
- Experimental data:
  - CEA (mean values corrected, enlarged unc. in wings, approximate cov.),
  - Chi-Nu (approximate cov.),
  - Chatillon.



# Mean energy continuity:



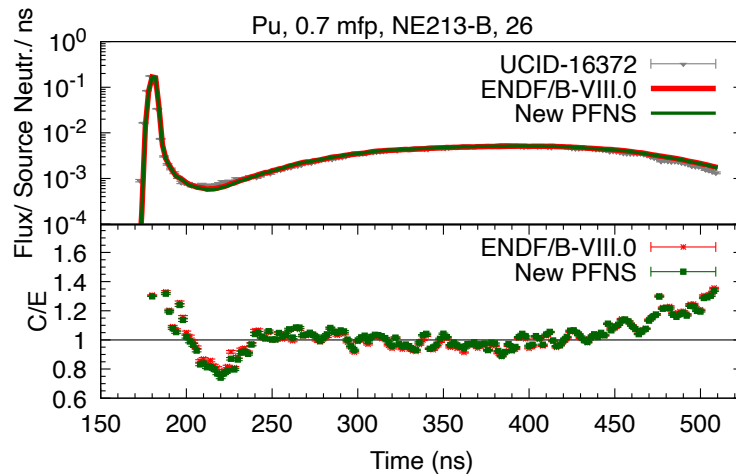
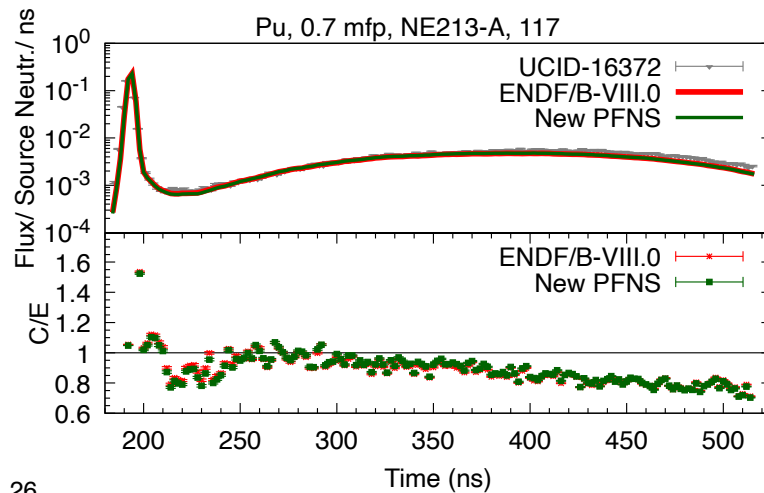
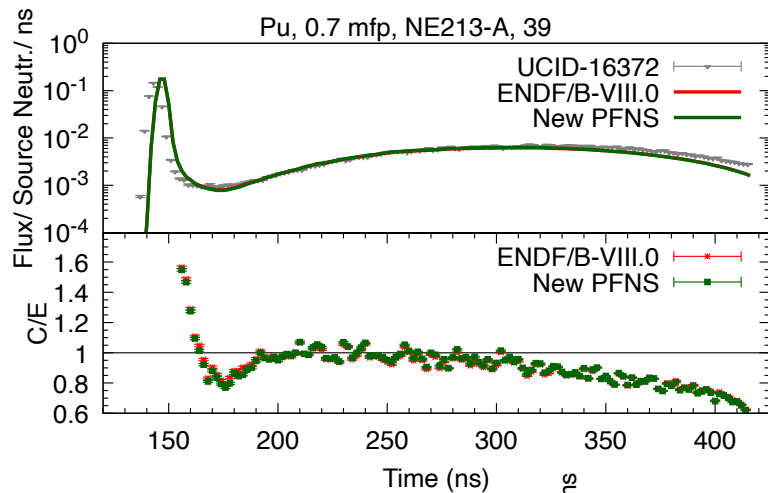
**Benchmarking (green: change within VIII.0+ MC unc., red: change outside of VIII.0+MC unc., unc. on last digit).**

Jezebel	Keff	Pu9(n,2n)/(n,f)	Pu9(n,g)/(n,f)	U8/U5(n,f)	Np/U5(n,f)	U3/U5(n,f)	Pu9/U5(n,f)
VIII.0	1.00069(1)	0.00230(5)	0.0345(2)	0.212(1)	0.9768(5)	1.566(7)	1.427(6)
VIII.0+new PFNS	0.99941(1)	0.00225(5)	0.0354(2)	0.209(1)	0.9660(5)	1.566(7)	1.424(6)

Flatop-Pu	Keff	Pu9(n,2n)/(n,f)	Pu9(n,g)/(n,f)	U8/U5(n,f)	Np/U5(n,f)
VIII.0	0.99971(1)	0.00197(4)	0.0455(1)	0.1800(9)	0.8591(4)
VIII.0+new PFNS	0.99857(1)	0.00193(4)	0.0464(1)	0.1775(9)	0.8499(4)



# Benchmarking Pulsed Sphere: little change.



# $^{239}\text{Pu}$ PFNS evaluation: potential release candidate.

- Thermal: INDEN PFNS, exp. only evaluation.
- 0.5-2.0: evaluation separately at each  $E_{\text{inc}}$  with LAM and experimental data.
- 3-30 MeV: evaluation across all  $E_{\text{inc}}$  with LAM and experimental data.
- CEA mean values were corrected for ratio-effect.
- Change in  $k_{\text{eff}}$  needs to be counter-balanced, pulsed spheres ok, RR ok.

